BNC Model 835-3 Programmer's Manual

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1. Introduction

This manual provides information for remote operation of the 835-3 Signal Generators using commands sent from an external controller via Ethernet. It includes the following:

- A general description of the LAN and the bus data transfer and control functions
- A general description of how to establish connection to the BNC Model 835-3 via LAN
- A listing of the IEEE-488 Interface Function Messages recognized by the signal generator with a description of its response
- A complete listing and description of all the Standard Commands for Programmable Instruments (SCPI) commands that can be used to control signal generator operation with examples of command usage

Ethernet Interface Connection and Setup

The BNC MODEL 835-3 fully supports the IEEE-802.3 standard. Most front panel functions (except power on/off) can be remotely controlled via a network server and an Ethernet connection. The BNC MODEL 835-3 software supports the TCP/IP network protocol.
Ethernet uses a bus or star topology where all of the interfacing devices are connected to a central cable called the bus, or are connected to a hub. Ethernet uses the CSMA/CD access method to handle simultaneous transmissions over the bus. CSMA/CD stands for *Carrier Sense Multiple Access/Collision Detection*. This standard enables network devices to detect simultaneous data channel usage, called a *collision*, and provides for a contention protocol. When a network device detects a collision, the CSMA/CD standard dictates that the data will be retransmitted after waiting a random amount of time. If a second collision is detected, the data is again retransmitted after waiting twice as long. This is known as exponential back off.
The TCP/IP setup requires the following:
● IP Address: Every computer/electronic device in a TCP/IP network requires an IP address. An IP address has four numbers (each between 0 and 255) separated by periods. For example: 192.168.1.50 is a valid IP address.
● Subnet Mask: The subnet mask distinguishes the portion of the IP address that is the network ID from the portion that is the station ID. The subnet mask 255.255.0.0, when applied to the IP address given above, would identify the network ID as 192.168 and the station ID as 1.50. All stations in the same local area network should have the same network ID, but different station IDs.
● Default Gateway: A TCP/IP network can have a gateway to communicate beyond the LAN identified by the network ID. A gateway is a computer or electronic device that is connected to two different networks and can move TCP/IP data from one network to the other. A single LAN

that is not connected to other LANs requires a default gateway setting of 0.0.0.0. If you have a gateway, then the default gateway would be set to the appropriate value of your gateway.
● MAC Address: A MAC address is a unique 48-bit value that identifies a network interface card to the rest of the network. Every network card has a unique MAC address permanently stored into its memory.

Interface between the signal generator and other devices on the network is via a category five (CAT-5) interface cable connected to a network. This cable uses four twisted pairs of copper insulators terminated into an RJ45 connector. CAT-5 cabling is capable of supporting frequencies up to 100 MHz and data transfer speeds up to 1 Gbps, which accommodates 1000Base-T, 100Base-T, and 10Base-T networks.
The instrument can be remotely programmed using the VXI-11 protocol. A VISA I/O library (like NI-VISA™) is used on the server side to facilitate the communications. A VISA installation on the controller is a prerequisite for remote control over LAN interface. VISA is a standardized software interface library providing input and output functions to communicate with instruments. For more information about VISA refer to the VISA library supplier's documentation.
The SCPI command set listed in the BNC MODEL 835-3 programmer's manual applies to LAN programming as well.
Only the IP address or the device name is required for link setup. The IP address/device name is part of the "visa resource string" used by the programs for identification and control of the instrument. The visa resource string has the form:

TCPIP::ipaddr::inst0::INSTR

ipaddr has to be replaced by the IP address or the computer name of the instrument.
For instance, if the instrument has the IP address 192.168.1.50,
TCPIP::192.168.1.50::inst0::INSTR is the valid resource name. Specification of **inst0** in the resource name is optional. In this example, also

TCPIP::192.168.1.50::INSTR is therefore a valid resource name.

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TCPIP designates the network protocol used and **INSTR** indicates that the VXI-11 protocol is used. If several instruments are connected to the network, each instrument has its own IP address and associated resource name. The controller identifies these instruments by means of the resource name.

2. Programming the BNC MODEL 835-3

The BNC Model 835-3 signal generator can be remotely programmed via a 10/100/1000Base-T LAN interface and LAN-connected computer using one of several LAN interface protocols. The LAN allows instruments to be connected together and controlled by a LAN- based computer. LAN and its associated interface operations are defined in the IEEE 802.2 standard.
The BNC MODEL 835-3 support the following LAN interface protocols:

1) **Socket based LAN:** the application programming interface (API) provided with the instrument supports general programming using the LAN interface under Windows operating system.
2) **VXI-11/SCPI** (version 1999) commands
3) **Telephone Network** (TELNET): TELNET is used for interactive, one command at a time instrument control.
4) **Internet protocol** using a web browser (Firefox, Internet Explorer) (firmware 2.2 upwards)

For LAN operation, the signal generator must be connected to the LAN, and an IP address must be assigned to the signal generator either manually or by using DHCP client service. Your system administrator can tell you which method to use. (Most current LAN networks use DHCP.)

DHCP Configuration

If the DHCP server uses dynamic DNS to link the hostname with the assigned IP address, the hostname may be used in place of the IP address. Otherwise, the hostname is not usable.

Using Sockets LAN

Sockets LAN is a method used to communicate with the signal generator over the LAN interface using the Transmission Control Protocol/Internet Protocol (TCP/IP). A socket is a fundamental technology used for computer networking and allows applications to communicate using standard mechanisms built into network hardware and operating systems. The method accesses a port on the signal generator from which bidirectional communication with a network computer can be established.
Sockets LAN can be described as an internet address that combines Internet Protocol (IP) with a device port number and represents a single connection between two pieces of software. The socket can be accessed using code libraries packaged with the computer operating system. Two common versions of socket libraries are the Berkeley Sockets Library for UNIX systems and Winsock for Microsoft operating systems.
Your signal generator implements a socket Applications Programming Interface (API) that is compatible with Berkeley socket for UNIX systems, and Winsock for Microsoft systems. The signal generator is also compatible with other standard sockets APIs. The signal generator can

be controlled using predefined SCPI functions once the socket connection is established in your program. Socket connection is available on **port 18**.

Using and Configuring VXI-11 (VISA)

The signal generator supports the LAN interface protocol described in the VXI- 11 standard. VXI- 11 is an instrument control protocol based on Open Network Computing/Remote Procedure Call (ONC/RPC) interfaces running over TCP/IP.
A range of standard software such as NI-VISA or Agilent IO Config is available to setup the computer/signal generator interface for the VXI- 11 protocol. Please refer to the applicable software user manual and documentation for information on running the program and configuring the VXI-11 interface. The program is used to configure the LAN client. Once the computer is configured for a LAN client, you can use the VXI- 11 protocol and the VISA library to send SCPI commands to the signal generator over the LAN interface. Example programs are available on request under support@Berkeley Nucleonics.com.

VISA is an IO library used to develop IO applications and instrument drivers that comply with industry standards. It is recommended that the VISA library be used for programming the signal generator. The NI-VISA and Agilent VISA libraries are similar implementations of VISA and have the same commands, syntax, and functions.

Using SCPI for BNC MODEL 835-3

The Standard Commands for Programmable Instrumentation (SCPI) provides a uniform and consistent language to control programmable test and measurement devices in instrumentation systems. The SCPI Standard is built on the foundation of IEEE-488.2, Standard Codes and Formats. It requires conformance to IEEE-488.2, but is pure software standard. SCPI syntax is ASCII text, and therefore can be attached to any computer test language, such as BASIC, C, or C++. It can also be used with Test Application Environments such as LabWindows/CVI, LabVIEW™, or Matlab®. SCPI is hardware independent. SCPI strings can be sent over any instrument interface. It works equally well over GPIB, RS-232, VXIbus or LAN networks.

Please see the chapter 4 for detailed description of supported SCPI commands.

Using Telnet LAN

Telnet provides a means of communicating with the signal generator over the LAN. The Telnet client, run on a LAN connected computer, will create a login session on the signal generator. A connection, established between computer and signal generator, generates a user interface display screen with “>” prompts on the command line.
Using the Telnet protocol to send commands to the signal generator is similar to communicating with the signal generator over LAN. You establish a connection with the signal

generator and then send or receive information using predefined commands. Communication is interactive: one command at a time. The telnet service is available on **port 18**.
Once a telnet session to the device is established, the echo can be enabled by typing

SYST:COMM:SOCK:ECHO ON

Following this command a prompt ">>" should become visible.

Internet Browser

The BNC MODEL 835-3 hosts a web-server (firmware 2.1 upwards) that allows you to remotely perform basic control of the device platform independent from any current web-browsers.

To connect to your 835-3 via a web browser, the device must exist within the LAN and the (dynamic) IP must be known. It can be accessed by typing the IP into the browser's URL window.

PARAMETER DEFAULT

Host Name:	BNC MODEL 835-3
IP Address	DHCP-acquired. If DHCP absent, assigned via Auto-IP (169.254.5.5)
Subnet Mask	DHCP-acquired. If DHCP absent, assigned via Auto-IP
Gateway	0.0.0.0
DNS Server	0.0.0.0
Listening Port	9221
User ID	admin
Password	835-3
Ping	Echo On

3. IEEE-488 Interface Commands

IEEE Mandated Commands

The required common commands are IEEE-488.2 mandated commands that are defined in the IEEE-488.2 standard and must be implemented by all SCPI compatible instruments. These commands are identified by the asterisk (*) at the beginning of the command keyword. These commands are used to control instrument status registers, status reporting, synchronization, and other common functions.

Commands declared mandatory by *IEEE 488.2*.

*CLS Clear Status Command
*ESE Standard Event Status Enable Command
*ESE? Standard Event Status Enable Query
*ESR? Standard Event Status Register Query
*IDN? Identification Query
*OPC Operation Complete Command
*OPC? Operation Complete Query
*RST Reset Command
*SRE Service Request Enable Command
*SRE? Service Request Enable Query
*STB? Read Status Byte Query
*TST? Self-Test Query
*WAI Wait-to-Continue Command

*CLS

The Clear Status (CLS) command clears the status byte by emptying the error queue and clearing all the event registers including the Data Questionable Event Register, the Standard Event Status Register, the Standard Operation Status Register and any other registers that are summarized in the status byte.

*ESE <data>

The Standard Event Status Enable (ESE) command sets the Standard Event Status Enable Register. The variable <data> represents the sum of the bits that will be enabled.
Range 0–255
Remarks The setting enabled by this command is not affected by signal generator preset or *RST. However, cycling the signal generator power will reset this register to zero.

*ESE?

The Standard Event Status Enable (ESE) query returns the value of the Standard Event Status Enable Register.

*ESR?

The Standard Event Status Register (ESR) query returns the value of the Standard Event Status Register.
NOTE: Reading the Standard Event Status Register clears it
Remarks The Register is not affected by signal generator preset or *RST. However, cycling the signal generator power will reset this register to zero.

***IDN?**
The Identification (IDN) query outputs an identifying string. The response will show the following information: <company name>, <model number>, <serial number>, <firmware revision>

***OPC**
The Operation Complete (OPC) command sets bit 0 in the Standard Event Status Register when all pending operations have finished.
The Operation Complete command causes the device to set the operation complete bit (bit 0) in the Standard Event Status Register when all pending operations have been finished.

***OPC?**
The Operation Complete (OPC) query returns the ASCII character 1 in the Standard Event Status Register when all pending operations have finished.
This query stops any new commands from being processed until the current processing is complete. This command blocks the communication until *all* operations are complete (i.e. the timeout setting should be longer than the longest sweep).

***OPT?**
The options (OPT) query returns a comma-separated list of all of the instrument options currently installed on the signal generator.

***PSC ON|OFF|1|0**
The Power-On Status Clear (PSC) command controls the automatic power- on clearing of the Service Request Enable Register, the Standard Event Status Enable Register, and device- specific event enable registers.
ON (1) This choice enables the power- on clearing of the listed registers.
OFF (0) This choice disables the clearing of the listed registers and they retain their status when a power- on condition occurs.

***PSC?**
The Power-On Status Clear (PSC) query returns the flag setting as enabled by the *PSC command.

***RCL <reg>**
The Recall (RCL) command recalls the state from the specified memory register <reg>.

***RST** affected
The Reset (RST) command resets most signal generator functions to factory- defined conditions.
Remarks Each command shows the [*RST] default value if the setting is affected.

***SAV <reg>**
The Save (SAV) command saves signal generator settings to the specified memory register <reg>.
Remarks The save function does not save all signal generator settings. Refer to the *User's Guide* for more information on the save function.

***SRE <data>**
The Service Request Enable (SRE) command sets the value of the Service Request Enable Register. The variable <data> is the decimal sum of the bits that will be enabled. Bit 6 (value 64) is ignored and cannot be set by this command.

Range 0–255
The setting enabled by this command is not affected by signal generator preset or *RST. However, cycling the signal generator power will reset it to zero.

***SRE?**
The Service Request Enable (SRE) query returns the value of the Service Request Enable Register.
Range 0–63 & 128-191

***STB?**
The Read Status Byte (STB) query returns the value of the status byte including the master summary status (MSS) bit.
Range 0–255

***TRG**
The Trigger (TRG) command triggers the device if LAN is the selected trigger source, otherwise, *TRG is ignored.

***TST?**
The Self-Test (TST) query initiates the internal self- test and returns one of the following results:
0 This shows that all tests passed.
1 This shows that one or more tests failed.
Key Entry Run Complete Self Test

***WAI**
The Wait- to- Continue (WAI) command causes the signal generator to wait until all pending commands are completed, before executing any other commands.

4. SCPI Commands

This chapter provides an introduction to SCPI programming that includes descriptions of the command types, hierarchical command structure, data parameters, and notational conventions. Information on BNC MODEL 835-3 status system and trigger system programming is also provided.

Introduction

Standard Commands for Programmable Instruments (SCPI) is the new instrument command language for controlling instruments that goes beyond *IEEE 488.2* to address a wide variety of instrument functions in a standard manner. SCPI promotes consistency, from the remote programming standpoint, between instruments of the same class and between instruments with the same functional capability. For a given measurement function such as frequency or voltage, SCPI defines the specific command set that is available for that function. Thus, two oscilloscopes made by different manufacturers could be used to make frequency measurements in the same way. It is also possible for a SCPI counter to make a frequency measurement using the same commands as an oscilloscope. SCPI commands are easy to learn, self-explanatory and account for both novice and expert programmer's usage. Once familiar with the organization and structure

of SCPI, considerable efficiency gains can be achieved during control program development, independent of the control program language selected.

A key to consistent programming is the reduction of multiple ways to control similar instrument functions. The philosophy of SCPI is for the same instrument functions to be controlled by the same SCPI commands. To simplify learning, SCPI uses industry-standard names and terms that are manufacturer and customer supported.
The advantage of SCPI for the ATE system programmer is reducing the time learning how to program new SCPI instruments after programming their first SCPI instrument. Programmers who use programming languages such as BASIC, C, FORTRAN, etc., to send instrument commands to instruments will benefit from SCPI. Also, programmers who implement instrument device drivers for ATE program generators and/or software instrument front panels will benefit by SCPI's advantages. SCPI defines instrument commands, parameters, data, and status. It is not an application package, programming language, or software intended for instrument front panel control.
SCPI is designed to be layered on top of the hardware-independent portion of *IEEE 488.2.*

SCPI Command Types

SCPI commands, which are also referred to as SCPI instructions, are messages to the instrument to perform specific tasks. The BNC MODEL 835-3 command set includes:

- "Common" commands (IEE488.2 mandated commands)
- SCPI required commands
- SCPI optional commands (per SCPI 1999.0)
- SCPI compliant commands that are unique to the BNC MODEL 835-3. Not all of the commands supported by the instrument are taken from the SCPI standard, however, their syntax follows SCPI rules.

SCPI Command Syntax

Typical SCPI commands consist of one or more keywords, parameters, and punctuation. SCPI command keywords can be a mixture of upper and lower case characters. Except for common commands, each keyword has a long and a short form. In this manual, the long form is presented with the short form in upper case and the remainder in lower case. Unrecognized versions of long form or short form commands, or improper syntax, will generate an error.

Structure of a Command Line

A command line may consist of one or several commands. It is terminated by an EOI together with the last data byte.

Several commands in a command line must be separated by a semicolon ";". If the next command belongs to a different command system, the semicolon is followed by a colon.

A colon ":" at the beginning of a command marks the root node of the command tree.

If the successive commands belong to the same system, having one or several levels in common, the command line can be abbreviated. To this end, the second command after the semicolon starts with the level that lies below the common levels. The colon following the semicolon must be omitted in this case.

Responses to Queries

A query is defined for each setting command unless explicitly specified otherwise. It is formed by adding a question mark to the associated setting command. According to SCPI, the responses to queries are partly subject to stricter rules than in standard IEEE 488.2.

Parameters

Most commands require a parameter to be specified. The parameters must be separated from the header by a "white space". Permissible parameters are numerical values, Boolean parameters, text, character strings and block data. The type of parameter required for the respective command and the permissible range of values are specified in the command description.

Numerical values Numerical values can be entered in any form, i.e. with sign, decimal point and exponent. Values exceeding the resolution of the instrument are rounded up or down. The mantissa may comprise up to 255 characters, the values must be in the value range –9.9E37 to 9.9E37. The exponent is introduced by an "E" or "e". Entry of the exponent alone is not allowed.

Units In the case of physical quantities, the unit can be entered. Permissible unit prefixes are G (giga), MA (mega), MHZ are also permissible), K (kilo), M (milli), U (micro) and N (nano). If the unit is missing, the basic unit is used.

Boolean Parameters Boolean parameters represent two states. The ON state (logically true) is represented by ON or a numerical value unequal to 0. The OFF state (logically false) is represented by OFF or the numerical value 0. ON or OFF is returned by a query.

Hierarchical Command Structure

All SCPI commands, except the common commands, are organized in a hierarchical structure similar to the inverted tree file structure used in most computers. The SCPI standard refers to this structure as "the Command Tree." The command keywords that correspond to the major instrument control functions are located at the top of the command tree. The command keywords for the BNC MODEL 835-3 SCPI command set are shown below.

:ABORt
:DIAGnostic
:DISPlay
:INITiate
:OUTput
SOURce
:STATus
:SYSTem
:TRIGger
:UNIT

All BNC MODEL 835-3 SCPI commands, except the :ABORt command, have one or more subcommands (keywords) associated with them to further define the instrument function to be controlled. The subcommand keywords may also have one or more associated subcommands (keywords). Each subcommand level adds another layer to the command tree. The command keyword and its associated subcommand keywords form a portion of the command tree called a command subsystem.

Status System Programming

The BNC MODEL 835-3 implements the **status byte register**, the **Service Request Enable Register**, the **Standard Event Status Register**, and the **Standard Event Status Enable Register**.

The BNC MODEL 835-3 status system consists of the following SCPI-defined status reporting structures:

- The Instrument Summary Status Byte
- The Standard Event Status Group
- The Operation Status Group
- The Questionable Status Group

The following paragraphs describe the registers that make up a status group and explain the status information that each status group provides.

Status Registers

In general, a status group consists of a condition register, a transition filter, an event register, and an enable register. Each component is briefly described in the following paragraphs.

Condition Register

The condition register is continuously updated to reflect the current status of the BNC MODEL 835-3. There is no latching or buffering for this register, it is updated in real time. Reading the contents of a condition register does not change its contents.

Transition Filter

The transition filter is a special register that specifies which types of bit state changes in the condition register will set corresponding bits in the event register. Negative transition filters (NTR) are used to detect condition changes from True (1) to False (0); positive transition filters (PTR) are used to detect condition changes from False (0) to True (1). Setting both positive and negative filters True allows an event to be reported anytime the condition changes. Transition filters are read-write. Transition filters are unaffected by queries or *CLS (clear status) and *RST commands. The command :STATus:PRESet sets all negative transition filters to all 0's and sets all positive transition filters to all 1's.

Event Register

The event register latches transition events from the condition register as specified by the transition filter. Bits in the event register are latched, and once set they remain set until cleared by a query or a *CLS command Event registers are read only.

Enable Register

The enable register specifies the bits in the event register that can produce a summary bit. The BNC MODEL 835-3 logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are recorded in the Summary Status Byte. Enable registers are read-write. Querying an

enable register does not affect it. The command :STATus:PRESet sets the Operation Status Enable register and the Questionable Status Enable register to all 0's.

Status Group Reporting

The state of certain BNC MODEL 835-3 hardware and operational events and conditions can be determined by programming the status system. Three lower status groups provide status information to the Summary Status Byte group. The Summary Status Byte group is used to determine the general nature of an event or condition and the other status groups are used to determine the specific nature of the event or condition.

Summary Status Byte Group

The Summary Status Byte group, consisting of the Summary Status Byte Enable register and the Summary Status Byte, is used to determine the general nature of a 835-3 event or condition. The bits in the Summary Status Byte provide the following:

Operation Status Group

The Operation Status group, consisting of the Operation Condition register, the Operation Positive Transition register, the Operation Negative Transition register, the Operation Event register and the Operation Event Enable register.

Standard Event Status Group

The Standard Event Status group, consisting of the *Standard Event Status register* (an Event register) and the *Standard Event Status Enable register*, is used to determine the specific event that set bit 5 of the Summary Status Byte.

The bits in the *Standard Event Status register* provide the following:

Bit	Description
0	Set to indicate that all pending 835-3 operations were completed following execution of the "*OPC" command.
1	Request control
2	Set to indicate that a query error has occurred. Query errors have SCPI error codes from –499 to –400.
3	Set to indicate that a device-dependent error has occurred. Device-dependent errors have SCPI error codes from –399 to –300 and 1 to 32767.
4	Set to indicate that an execution error has occurred. Execution errors have SCPI error codes from –299 to –200.
5	Set to indicate that a command error has occurred. Command errors have SCPI error codes from –199 to –100.
6	User request
7	Power on

Standard Event Status Enable register (ESE commands)

Operation Status Group

The Operation Status group, consisting of the Operation Condition register, the Operation Positive Transition register, the Operation Negative Transition register, the Operation Event register, and the Operation Event Enable register, is used to determine the specific condition that set bit 7 in the Summary Status Byte. The bits in the Operation Event register provide the following:

Questionable Status Group

The Questionable Status group, consisting of the Questionable Condition register, the Questionable Positive Transition register, the Questionable Negative Transition register, the Questionable Event register, and the Questionable Event Enable register, is used to determine the specific condition that set bit 3 in the Summary Status Byte.

SCPI Command Description

:ABORt Subsystem

The :ABORt command is a single command subsystem. There are no subcommands or associated data parameters, as shown below. The :ABORt command, along with the :TRIGger and :INITiate commands, comprise the Trigger group of commands.

Command	Parameters	Unit (default)	Remark
:ABORt			

:ABORt
:ABORt
This command causes the List or Step sweep in progress to abort. Even if INIT:CONT[:ALL] is set to ON, the sweep will not immediately re-initiate.

:DISPlay Subsystem

The :DISPlay subsystem controls the display of the front panel data display.

Command	Parameters	Unit (default)	Remark
:DISPlay[:WINDow]:TEXT:[STATe]	ON|OFF|1|0		FW2.4
:DISPlay:REMote	ON|OFF|1|0		FW2.4

:DISPlay:WINDow:TEST ON|OFF|1|0
:DISPlay[:WINDow]:TEXT:[STATe] ON|OFF|1|0
:DISPlay[:WINDow]:TEXT:STATe?
Turns on/off the parameter display of the BNC MODEL 835-3 front panel data display.

:DISPlay:REMote ON|OFF|1|0
:DISPlay:REMote ON|OFF|1|0
:DISPlay:REMote?
Turns on/off the display update of the BNC MODEL 835-3 front panel data display.

:INITiate Subsystem

The :INITiate subsystem controls the state of the BNC MODEL 835-3 trigger system. The subsystem commands and parameters are described below. The :INITiate commands, along with the :ABORt and :TRIGger commands, comprise the Trigger Group of commands.

Command	Parameters	Unit (default)	Remark
:INITiate[:IMMediate]		ON	
:INITiate:CONTinuous	ON|OFF|1|0	OFF	

:INITiate[:IMMediate]
Sets BNC MODEL 835-3 trigger to the armed state.

:INITiate:CONTinuous ON|OFF|1|0

Continuously rearms the BNC MODEL 835-3 trigger system after completion of a triggered
sweep.

:OUTPut Subsystem

Command	Parameters	Unit (default)	Remark
OUTPut[:STATe]	ON | OFF | 1 | 0	OFF	
OUTPut:BLANking	ON | OFF | 1 | 0	OFF	FW2.4

[:STATe] ON|OFF|1|0
:OUTPut[:STATe] ON|OFF|1|0
Turns BNC MODEL 835-3 RF output power on/off.

:BLANking[:STATe] ON|OFF|1|0
:OUTPut:BLANking[:STATe] ON|OFF|1|0
:OUTPut:BLANking[:STATe]?
ON causes the RF output to be turned off (blanked) during frequency changes. OFF leaves RF output turned on (unblanked).

[SOURce]:FREQuency Subsystem

Command	Parameters	Unit (default)
[SOURce]:FREQuency:FIXed | CW	fmin to fmax	Hz
[SOURce]:FREQuency:MODE	FIX | CW | SWEep | LIST	FIXed
[SOURce]:FREQuency:STARt	fmin to fmax	Hz
[SOURce]:FREQuency:STOP	fmin to fmax	Hz
[SOURce]:FREQuency:STEP[:LINear]	0 to fmax-fmin	Hz
[SOURce]:FREQuency:STEP:LOGarithmic	0 to 255.999999999	

:FREQuency[:CW]
[SOURce]:FREQuency[:CW] <value><unit>
[SOURce]:FREQuency[:CW]?
This command sets the signal generator output frequency for the CW frequency mode.
***RST** 100 MHz
Range Please refer to the *Data Sheet*.

:FREQuency:MODE
[SOURce]:FREQuency:MODE FIX|CW|SWEep|LIST
[SOURce]:FREQuency:MODE?
This command sets the frequency mode of the signal generator to CW or swept.

FIX | CW	Stops a frequency sweep
SWEep or LIST	This choice selects the swept frequency mode. If sweep triggering is set to immediate along with continuous sweep mode, executing the command starts the LIST or SWEep frequency sweep. In SWEep mode, frequency will be determined by programmed values for the :STARt and :STOP :FREQuency subsystem commands. In LIST

mode, frequency is determined by programmed values for :LIST:FREQuency.

:FREQuency:STARt
[SOURce]:FREQuency:STARt <value><unit>
[SOURce]:FREQuency:STARt?
This command sets the first frequency point in a step sweep.
***RST** The preset value is 1 GHz. Please refer to the *Data Sheet*.
Range Please refer to the *Data Sheet*.

:FREQuency:STOP
[SOURce]:FREQuency:STOP <value><unit>
[SOURce]:FREQuency:STOP?
This command sets the last frequency point in a step sweep.
***RST** The preset value is 2 GHz.
Range Please refer to the *Data Sheet*.

[SOURce]:FREQuency:STEP
[SOURce]:FREQuency:STEP[:LINear] <value><unit>
This command sets the step size for a linear step sweep.

[SOURce]:FREQuency:STEP:LOGarithmic
[SOURce]:FREQuency:STEP:LOGarithmic <value>
This command sets the step size for a logarithmic step sweep.

[SOURce]:PHASe Subsystem

Command	Parameters	Unit (default)	Remark
[SOURce]:PHASe:REFerence		radians	FW2.4
[SOURce]:PHASe[:ADJust]	<value>	radians	

:PHASe:REFerence
[SOURce]:PHASe:REFerence
This command sets the current output phase as a zero reference. Subsequent phase adjustments are set relative to the new reference.

:PHASe[:ADJust]
[SOURce]:PHASe[:ADJust] <value><unit>
[SOURce]:PHASe[:ADJust]?
This command adjusts the phase of the signal. The query will only return values in radians.
***RST** The preset value is 0.

[SOURce]:POWer Subsystem

Command	Parameters	Unit (default)	
[SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude]	<value>	dBm	
[SOURce]:POWer:MODE	FIXed|LIST|SWE	FIXed	

	ep		
[SOURce]:POWer:STARt	<value>	dBm	
[SOURce]:POWer:STOP	<value>	dBm	
[SOURce]:POWer:ALC	ON | OFF | 1 | 0	ON	
[SOURce]:POWer:ALC:HOLD	ON | OFF | 1 | 0	OFF	
[SOURce]:POWer:ATTenuation	<value>	dB	FW2.219
[SOURce]:POWer:ATTenuation:AUTO	ON | OFF | 1 | 0	ON	FW2.219
[SOURce]:POWer:ATTenuation:LIST?			FW2.219

[:LEVel][:IMMediate][:AMPLitude]
[SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude] <value><unit>
[SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude]?
This command sets the RF output power.

:MODE
[SOURce]:POWer:MODE CW|LIST|SWEep
[SOURce]:POWer:MODE?
This command sets the signal generator power mode to fixed or swept.

FIX	This choice stops a power sweep, allowing the signal generator to operate at a fixed power level. Refer to [:LEVel][:IMMediate][:AMPLitude] command for setting the output power level.
LIST or SWEep	This choice selects the swept power mode. If sweep triggering is set to immediate along with continuous sweep mode, executing the command starts the LIST or STEP power sweep.

:STARt
[SOURce]:POWer:STARt <value><unit>
[SOURce]:POWer:STARt?
This command sets the first amplitude point in a step sweep.
Range

:STOP
[SOURce]:POWer:STOP <value><unit>
[SOURce]:POWer:STOP?
This command sets the last amplitude point in a step sweep.
Range

:ALC
[SOURce]:POWer:ALC ON|OFF|1|0
[SOURce]:POWer:ALC?
This command turns the automatic power level control on and off.

:ALC:HOLD
[SOURce]:POWer:ALC:HOLD ON|OFF|1|0
[SOURce]:POWer:ALC?
(Devices with option PE only)
This command sets the automatic level control into hold mode. The amplitude level control loop is open.

:ATTenuation
[SOURce]:POWer:ATTenuation <value>
[SOURce]:POWer:ATTenuation?
(Devices with option PE only)

This command sets the power range extension attenuator. This command will also turn off automatic attenuation setting. Refer to [SOURce]:POWer:ATTenuation:AUTO OFF for details. Attenuator input RF power shall be -30…+10 dBm, e.g. using a [SOURce]:POWer:ATTenuation value of 50 dB, the output RF power range is -80…-40 dBm.

:ATTenuation:AUTO
[SOURce]:POWer:ATTenuation:AUTO ON|OFF|1|0
[SOURce]:POWer:ATTenuation:AUTO?
(Devices with option PE only)
This command turns the power range extension on or off. Turning it off allows fast power sweeps for devices featuring an extended output power range.

:ATTenuation:LIST?
[SOURce]:POWer:ATTenuation:LIST?
(Devices with option PE only)
This query returns a comma-separated list of available attenuation settings. These can be set using the [SOURce]:POWer:ATTenuation command.
Available settings are:
0, 35, 70 dB for option PE
0, 10, 20, …, 110 dB for option PE2

[SOURce]:ROSCillator Subsystem

Command	Parameters	Unit (default)
[SOURce]:ROSCillator:EXTernal:FREQuency	<val>	100 MHz
[SOURce]:ROSCillator:SOURce	INTernal|EX Ternal	INT

:REFerence:EXTernal:FREQuency <val>
[SOURce]:ROSCillator:EXTernal:FREQuency <val>
This command conveys the expected reference frequency value of an externally applied reference the signal generator. The variable <val> is expressed in units of MHz.
***RST** 10 MHz
Range 1 to 100 MHz in 1 MHz steps

: SOURce
[SOURce]:ROSCillator: SOURce INT|EXT
This command selects either an internal or external reference for the waveform clock.
*RST INT

[SOURce]:LIST Subsystem

Command	Parameters	Unit (default)	Remark
[SOURce]:LIST:DIRection	UP|DOWN|RANDom	UP	
[SOURce]:LIST:DWELl	<value>	s	
[SOURce]:LIST:DELay	<value>	s	
[SOURce]:LIST:DELay:AUTO	ON|OFF|1|0	ON	
[SOURce]:LIST:FREQuency:POINts?			
[SOURce]:LIST:FREQuency	<value>{,<value>}	Hz	

[SOURce]:LIST:MANual	<value>|UP|DOWN		FW2.4
[SOURce]:LIST:MODE	AUTO | MANual		FW2.4
[SOURce]:LIST:POWer	<value>{,<value>}	dBm	
[SOURce]:LIST:POWer:POINts?			
[SOURce]:LIST:COUNt	<value>|INFinity	1	

:LIST:DIRection
[SOURce]:LIST:DIRection UP|DOWN|RANDom
[SOURce]:LIST:DIRection?
This command sets the direction of a list or step sweep. UP This choice enables a sweep in an ascending order:
• first to last point for a list sweep
• start to stop for a step sweep
DOWN This choice reverses the direction of the sweep.
***RST** UP

:LIST:DWELl
[SOURce]:LIST:DWELl <value>{,<value>}
[SOURce]:LIST:DWELl:POINts?
This command sets the dwell time for the current list sweep points. Dwell time is used when IMMediate is the trigger source. The dwell time is the amount of time the sweep is guaranteed to pause after setting the frequency and/or power for the current point.
The setting enabled by this command is not affected by signal generator power- on, preset, or *RST.
The variable <value> is expressed in units of seconds.

:LIST:DELay
[SOURce]:LIST:DELay <value>{,<value>}
[SOURce]:LIST:DELay:POINts?

This command sets the off time for the current list sweep points. Off time is used when IMMediate is the trigger source. The off time is the amount of time the output is guaranteed to be blanked after setting the frequency and/or power for the current point to suppress output transients during a frequency change.
The setting enabled by this command is not affected by signal generator power- on, preset, or *RST.
The variable <value> is expressed in units of seconds.

:LIST:DELay:AUTO
[SOURce]:LIST:DELay:AUTO ON|OFF|1|0
This command enabled the automatic blanking of the output during transients between two frequency steps.
***RST** ON

:LIST:FREQency:POINts
[SOURce]:LIST:POINts?
This command queries the signal generator for the number of frequency points in the current list sweep file.

:LIST:FREQuency
[SOURce]:LIST:FREQuency <value>{,<value>}
[SOURce]:LIST:FREQuency?
This command sets the frequency values for the current list sweep points.
The maximum number of list sweep points is 3’501.

The variable <value> is expressed in units of Hertz.
The setting enabled by this command is not affected by signal generator power- on, preset, or *RST.
Range Please refer to the *Data Sheet*.

:LIST:MANual
[SOURce]:LIST:MANual <value>|UP|DOWN
[SOURce]:LIST:MANual?
This command sets a list or step sweep point as the current sweep point controlling the frequency and power output. If list or step mode is controlling frequency or power, or both, then the indexed point in the respective list(s) will be used.
Entering a value with this command will have no effect, unless MANual is the selected mode. Refer to :LIST:MODE command for setting the proper mode.
If the point selected is beyond the length of the longest enabled list, then the point will be set to the maximum possible point, and an error will be generated.
Range 1–3'501

:LIST:MODE
[SOURce]:LIST:MODE AUTO|MANual
[SOURce]:LIST:MODE?
This command sets the operating mode for the current list or step sweep.
AUTO This choice enables the selected sweep type to perform a sweep of all points.
MANual This choice enables you to select a single sweep point. The selected point controls the frequency and/or amplitude according to the sweep type. Refer to :LIST:MANual command for selecting a sweep point.
***RST** AUTO

:LIST:POWer
[SOURce]:LIST:POWer <value>{,<value>}
[SOURce]:LIST:POWer?
This command sets the amplitude for the current list sweep points.

:LIST:POWer:POINts
[SOURce]:LIST:POWer:POINts?
This command queries the number of power points in the current list sweep file.

:LIST:COUNt
[SOURce]:LIST:COUNt <value>
[SOURce]:LIST:COUNt?
This command sets the number of consecutive times the list is executed on each sweep start.
The variable <value> is 1 to 65635 or INFinity.

[SOURce]:LFOutput Subsystem

Command	Parameters	Unit (default)
[SOURce]:LFOutput:AMPLitude	<value>	1 V
[SOURce]:LFOutput:FREQuency	<value>	400 Hz
[SOURce]:LFOutput:STATe	ON|OFF|1|0	OFF
[SOURce]:LFOutput:SHAPe	SINE|TRIangle|SQUare	SINE
[SOURce]:LFOutput:SOURce	LFGenerator|PULM|TRIGger	LFG

:LFOutput:AMPLitude
[SOURce]:LFOutput:AMPLitude <value>
[SOURce]:LFOutput:AMPLitude?
This command sets the low frequency generator amplitude. This setting does only take effect if :LFOutput:SOURce is set to LFGenerator and LFOutput:SHAPe is either set to SINE or TRIangle. Using any other setting, the output amplitude is fixed 2.5 V.
The variable <value> is expressed in units of Volt.
Range 0-2.5
***RST** 1

:LFOutput:FREQuency
[SOURce]:LFOutput:FREQuency <value>
[SOURce]:LFOutput:FREQuency?
This command sets the low frequency generator frequency. This setting does only take effect if :LFOutput:SOURce is set to LFGenerator.
The variable <value> is expressed in units of Hertz.
Range 10-5000000
***RST** 400

:LFOutput:STATe
[SOURce]:LFOutput:STATe ON|OFF|1|0
[SOURce]:LFOutput:STATe?
This command sets the function output / low frequency generator state.
***RST** OFF

:LFOutput:SHAPe
[SOURce]:LFOutput:SHAPe SINE|TRIangle|SQUare
[SOURce]:LFOutput:SHAPe?
This command sets the low frequency generator waveform. This setting does only take effect if :LFOutput:SOURce is set to LFGenerator.

SINE	Sine wave output, amplitude is selectable by the :LFOutput:AMPLitude setting.
TRIangle	Triangle wave output, amplitude is selectable by the :LFOutput:AMPLitude setting.
SQUare	Square wave output, amplitude is fixed 2.5 V.

***RST** SINE

:LFOutput:SOURce
[SOURce]:LFOutput:SOURce LFGenerator|PULM|TRIGger
[SOURce]:LFOutput:SOURce?
This command sets the low frequency generator waveform. This setting does only take effect if :LFOutput:SOURce is set to LFGenerator.

LFGenerator	This selects the low frequency generator as the function output signal.
PULM	This selects the pulse modulation video out as the function output signal.
TRIGger	This selects the trigger as the function output signal.

***RST** LFG

[SOURce]:SWEep Subsystem

Command	Parameters	Unit (default)

[SOURce]:SWEep:DIRection	UP | DOWN | RANDom	UP
[SOURce]:SWEep:POINts	2 to 3855	3855
[SOURce]:SWEep:DWELl	<value>	s
[SOURce]:SWEep:DELay	<value>	s
[SOURce]:SWEep:DELay:AUTO	ON|OFF|1|0	ON
[SOURce]:SWEep:SPACing	LINear | LOGarithmic	
[SOURce]:FREQuency:MODE	CW | SWEep | LIST	
[SOURce]:FREQuency:STARt	fmin to fmax	Hz
[SOURce]:FREQuency:STOP	fmin to fmax	Hz
[SOURce]:POWer:MODE	CW | LIST | SWEep	
[SOURce]:POWer:STARt	<value>	dBm
[SOURce]:POWer:STOP	<value	dBm

:DIRection UP|DOWN|RANDom

[SOURce]:SWEep:DIRection UP|DOWN|RANDom

:SWEep:POINts
[SOURce]:SWEep:POINts <value>
[SOURce]:SWEep:POINts?
This command defines the number of step sweep points.
***RST** 101
Range 2–3501

:SWEep:DWELl
[SOURce]:SWEep:DWELl <value>
[SOURce]:SWEep:DWELl?
This command sets the dwell time for the current step sweep points. Dwell time is used when IMMediate is the trigger source. The dwell time is the amount of time the sweep is guaranteed to pause after setting the frequency and/or power for the current point.
The setting enabled by this command is not affected by signal generator power- on, preset, or *RST.
The variable <value> is expressed in units of seconds (default: 1000 μS).

:SWEep:DELay
[SOURce]:SWEep:DELay <value>
[SOURce]:SWEep:DELay?
This command sets the off time for the current step sweep points. Off time is used when IMMediate is the trigger source. The off time is the amount of time the sweep is guaranteed to pause after setting the frequency and/or power for the current point.
The setting enabled by this command is not affected by signal generator power- on, preset, or *RST.
The variable <value> is expressed in units of seconds (default: 300 μS).

:SWEep:SPACing
[SOURce]:SWEep:SPACing LINear|LOGarithmic
[SOURce]:SWEep:SPACing?
This command enables the signal generator linear or logrithmic sweep modes. These commands require the signal generator to be in step mode.
The instrument uses the specified start frequency, stop frequency, and number of points for both linear and log sweeps.
***RST** LIN

:STARt
[SOURce]:POWer:STARt <value><unit>
[SOURce]:POWer:STARt?
This command sets the first amplitude point in a step sweep.
***RST** ?
Range Refer to [:LEVel][:IMMediate][:AMPLitude] command for the output power ranges.

:STOP
[SOURce]:POWer:STOP <value><unit>
[SOURce]:POWer:STOP?
This command sets the last amplitude point in a step sweep.
***RST** ?
Range Refer to [:LEVel][:IMMediate][:AMPLitude] command for the output power ranges.

[SOURce]:AM Subsystem (Amplitude Modulation)

Command	Parameters	Unit (default)
[SOURce]:AM:DEPTh	<value>	0.8 (80 PCT)
[SOURce]:AM:STATe	ON|OFF|1|0	
[SOURce]:AM:INTernal:FREQuency	<value>	400 Hz

:AM:INT:FREQuency
[SOURce]:AM:INTernal:FREQuency <value><unit>|UP|DOWN
[SOURce]:AM:INTernal:FREQuency?
This command sets the internal amplitude modulation rate.
***RST** 400 Hz
Range 400 Hz and 1000 Hz

The RF carrier is modulated when you have set the signal generator's AM modulation state to ON.
Whenever amplitude modulation is enabled, the **AM on** is in the display.

:AM:DEPTh
[SOURce]:AM[:DEPTh]: <value>
[SOURce]:AM[:DEPTh]:?
This command sets the amplitude modulation depth 0...1.
***RST** 0.8
Range 0-0.99

[SOURce]:FM Subsystem (Frequency Modulation)

Command	Parameters	Unit (default)
[SOURce:]FM:DEViation	<value>	10000 Hz
[SOURce:]FM:SENSitivity	<value>	10000 Hz/V
[SOURce:]FM:SOURce	EXTernal|LFGenerator	EXT
[SOURce:]FM:STATe	ON|OFF|1|0	OFF

:FM:DEViation
[SOURce]:FM:SENSitivity <value>
[SOURce]:FM: SENSitivity?
This command sets the frequency modulation deviation. This setting will be used if :FM:SOURce is set to LFGenerator.
The variable <value> is expressed in units of Hertz.
***RST** 10000

:FM:SENSitivity
[SOURce]:FM:SENSitivity <value>
[SOURce]:FM: SENSitivity?
This command sets the frequency modulation deviation per one volt peak amplitude signal input. This setting will be used if :FM:SOURce is set to EXTernal.
The variable <value> is expressed in units of Hertz per Volt.
***RST** 10000

:FM:SOURce
[SOURce]:FM:SOURce EXTernal|LFGenerator
[SOURce]:FM:SOURce?
This command selects the FM modulation signal source. If LFGenerator is selected, the device's function output has to be connected to the FM/PM input (at the rear panel).
***RST** EXT

:FM:STATe
[SOURce]:FM:STATe ON|OFF|1|0
[SOURce]:FM:STATe?
This command turns the frequency modulation on or off.
***RST** OFF

[SOURce]:PM Subsystem (Phase Modulation)

Command	Parameters	Unit (default)
[SOURce:]PM:DEViation	<value>	1 rad
[SOURce:]PM:SENSitivity	<value>	1 rad/V
[SOURce:]PM:SOURce	EXTernal|LFGenerator	EXT
[SOURce:]PM:STATe	ON|OFF|1|0	OFF

:PM:DEViation
[SOURce]:PM:SENSitivity <value>
[SOURce]:PM: SENSitivity?
This command sets the phase modulation deviation. This setting will be used if :PM:SOURce is set to LFGenerator.
The variable <value> is expressed in units of radians.
***RST** 1

:PM:SENSitivity
[SOURce]:FM:SENSitivity <value>
[SOURce]:FM: SENSitivity?
This command sets the phase modulation deviation per one volt peak amplitude signal input. This setting will be used if :PM:SOURce is set to EXTernal.
The variable <value> is expressed in units of radians per Volt.
***RST** 1

:PM:SOURce
[SOURce]:PM:SOURce EXTernal|LFGenerator
[SOURce]:PM:SOURce?
This command selects the PM modulation signal source. If LFGenerator is selected, the device's function output has to be connected to the FM/PM input (at the rear panel).
***RST** EXT

:PM:STATe
[SOURce]:PM:STATe ON|OFF|1|0
[SOURce]:PM:STATe?
This command turns the phase modulation on or off.
***RST** OFF

[SOURce]:PULM Subsystem (Pulse Modulation)

This additional functionality provides pulse modulation of the RF output signal delivered to the load by an internal or external modulation signal. The INTernal selection accesses the internally generated modulation input while EXTernal selects the external pulse (rear panel connector) input.

Command	Parameters	Unit (default)
[SOURce]:PULM:POLarity	NORMal | INVerted	NORMal
[SOURce]:PULM:INTernal:FREQuency	<frequency>	Hz
[SOURce]:PULM:INTernal:PERiod	<period>	s
[SOURce]:PULM:INTernal:PWIDth|WIDTh	<num>	s
[SOURce]:PULM:SOURce	INTernal|EXTernal	INT
[SOURce]:PULM:STATe	ON|OFF|1|0	OFF
[SOURce]:PULM:MODE	FIXed | LIST	FIXed

.**:PULM:POLarity**
[SOURce]:PULM:POLarity NORMal|INVerted
[SOURce]:PULM:POLarity?
This command selects the polarity of the pulse modulation, regardless if the internal or external modulation source is used.
***RST** Normal

:PULM:INTernal:FREQuency
[SOURce]:PULM:INTernal:FREQuency <frequency>
[SOURce]:PULM:INTernal:FREQuency?
This command sets the pulse rate for the internally- generated square wave using the variable <*frequency*>.
***RST** 400 Hz
Range INT: 0.1 Hz – 100 kHz, EXT: 0.1 Hz–10 MHz

:PULM:INTernal:PERiod
[SOURce]:PULM:INTernal:PERiod <period>
[SOURce]:PULM:INTernal:PERiod?
This command sets the pulse period for the internally generated pulse modulation using the variables <*value*>.

If the entered value for the pulse period is equal to or less than the value for the pulse width, the pulse width changes to a value that is less than the pulse period.
***RST** 2.5 ms
Range 200 ns – 10 s

:PULM:INTernal:PWIDth|WIDTh
[SOURce]:PULM:INTernal:PWIDth|WIDTh <num>
[SOURce]:PULM:INTernal:PWIDth|WIDTh?
This command sets the pulse width for the internally generated pulse signal.
This command sets the pulse width for the internally- generated pulse modulation using the variable *<num>.*
If the entered value for the pulse width is equal to or greater than the value for the pulse period, the pulse width changes to a value that is less than the pulse period.
***RST** 1.25 ms
Range 50 nS to PERiod

:PULM:SOURce
[SOURce]:PULM:SOURce INTernal|EXTernal
[SOURce]: PULM:SOURce?
***RST** INT

:PULM:STATe
[SOURce]:PULM:STATe ON|OFF|1|0
[SOURce]:PULM:STATe?
This command enables or disables pulse modulation for the selected path.
***RST** 0

:PULM:MODE
[SOURce]:PULM:MODE FIXed | LIST
[SOURce]:PULM:MODE?
This command sets the modulation mode. With "FIXed", the normal ON/OFF modulation can be performed. With LIST, a arbitrary bit pattern can be loaded that will be used to modulate the carrier. LIST mode will be available with firmware 2.1
***RST** 0

:TRIGger Subsystem

Triggers control the playback by telling the BNC MODEL 835-3 when to play the signal. Depending on the trigger settings for the BNC MODEL 835-3, the waveform playback can occur once, continuously, or the BNC MODEL 835-3 may start and stop playing the waveform repeatedly (GATE mode). A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the BNC MODEL 835-3 to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the signal generator requires only a single trigger. In this situation, the BNC MODEL 835-3 recognizes the first trigger and ignores the rest.
When you select a trigger mode, you may lose the signal from the RF output until you trigger the waveform.

There are four parts to configuring the trigger:

1. Choosing the trigger type which controls the waveform's transmission.
    - NORMal : trigger edge initiates/stops sweeps

- GATE : trigger level starts/stops sweep

2. Setting the waveform's response to triggers:
   — CONTinuous : reapeatedly accepts trigger events
   — SINGle : uses only one trigger event

3. Selecting the trigger source which determines how the BNC MODEL 835-3 receives its trigger signal, internally or externally. The GATE choice requires an external trigger.

3. Setting the trigger polarity when using an external source

Command	**Parameters**	**Unit (default)**
[SOURce]:TRIGger[:SEQuence]:TYPE	NORMal | GATE | POINT	
[SOURce]:TRIGger[:SEQuence]:TYPE:GATE	LOW|HIGH	HIGH
[SOURce]:TRIGger[:SEQuence]:SOURce	IMMediate|KEY|EXT|BUS	IMM
[SOURce]:TRIGger[:SEQuence]:DELay	<value>	S
[SOURce]:TRIGger[SEQuence]:SLOPe	POSitive|NEGative	POS
[SOURce]:RETRigger	ON|OFF|IMMediate	**Not implemented**
[SOURce]:TRIGger[:SEQuence]:ECOunt	<value>	1

:TRIGger:TYPE
[SOURce]:TRIGger:TYPE NORMal | GATE | POINT
[SOURce]:TRIGger:TYPE?
This command sets the trigger type that controls the waveform's playback.

The following list describes the trigger type command choices:

NORMal	Upon triggering, the waveform sequence plays according to settlings defined by :INITiate:CONTinuous (only once or repeatedly)
GATE	An external trigger signal repeatedly starts and stops the waveform's playback. The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection. The waveform plays during the inactive state and stops during the active polarity selection state. The active state can be set high or low. The gate mode works only with an external trigger source.
POINT	Upon triggering, only a single point of the sweep (list) is played.

***RST** NORM

:TRIGger:TYPE:GATE
[SOURce]:TRIGger:TYPE:GATE LOW|HIGH
[SOURce]:TRIGger:TYPE:GATE?
This command selects the active state (gate polarity) of the gate while using the gating trigger mode. The LOW and HIGH selections correspond to the low and high states of an external trigger signal. For example, when you select HIGH, the active state occurs during the high of the trigger signal.
When the active state occurs, the BNC MODEL 835-3 starts the waveform playback at the last played sample point, then stops the playback at the next sample point when the inactive state occurs.

LOW	The waveform playback starts when the trigger signal goes low (active state) and stops when the trigger signal goes high (inactive state).

HIGH The waveform playback starts when the trigger signal goes high (active state) and stops when the trigger signal goes low (inactive state).

***RST** HIGH

:TRIGger[SEQuence]SOURce

[SOURce]:TRIGger[SEQuence]:SOURce IMMediate|KEY|EXTernal|BUS
[SOURce]:TRIGger[SEQuence]:SOURce?
This command sets the trigger source.

IMMediate No waiting for a trigger event occurrs
KEY This choice enables manual triggering by pressing the front-panel **RFon/off**.
EXTernal This choice enables the triggering of a sweep event by an externally applied signal at the MOD IN connector.
BUS This choice enables triggering over the LAN using the *TRG or GET commands.

***RST** IMM

:TRIGger[SEQuence]:DELay

[SOURce]:TRIGger[SEQuence]:DELay <value>
[SOURce]:TRIGger[SEQuence]:DELay?
This command sets the amount of time to delay the BNC MODEL 835-3 response to an external trigger.
The delay is a path (time) delay between when the 835-3 receives the trigger and when it responds to the trigger. The delay does not occur until you turn it on. You can set the delay value either before or after turning it on.

:TRIGger[SEQuence]:SLOPe

[SOURce]:TRIGger[SEQuence]:SLOPe POSitive|NEGative
[SOURce]:TRIGger[SEQuence]:EXTernal:SLOPe?
This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the BNC MODEL 835-3 receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.
***RST** POS

:TRIGGer:RETRigger

[SOURce]:RETRigger ON|OFF|IMMediate
[SOURce]:RETRigger?
This command enables or disables the ARB retriggering mode; the retrigger mode controls how the retriggering function performs while a waveform is playing.

ON (1) This choice specifies that if a trigger occurs while a waveform is playing, the waveform will retrigger at the end of the current waveform sequence and play once more.
OFF (0) This choice specifies that if a trigger occurs while a waveform is playing, the trigger will be ignored.
IMMediate This choice specifies that if a trigger occurs while a waveform is playing, the waveform will reset and replay from the start immediately upon receiving a trigger.

***RST** ON

:TRIGger:ECOunt

[SOURce]:TRIGger:ECOunt <value>

This command sets a modulo on consecutive trigger events. Setting the value to N means that only every Nth trigger event will be considered. Setting it to one means will use every trigger event that does not occur during a running sweep.
***RST** 1
Range 1 to 255

:STATus Subsystem

This subsystem controls the status-reporting structures.

Command	Parameters	Unit (default)	Remark
:STATus:OPERation[:EVENt]?			Firmware 2.21
:STATus:OPERation:CONDition?			Firmware 2.21
:STATus:OPERation:ENABle	<value>		Firmware 2.21
:STATus:OPERation:PTR	<value>		Firmware 2.21
:STATus:OPERation:NTR	<value>		Firmware 2.21
:STATus:PREset			Firmware 2.21
:STATus:QUEStionable[:EVENt]?			Firmware 2.21
:STATus:QUEStionable:CONDition?			Firmware 2.21
:STATus:QUEStionable:ENABle	<value>		Firmware 2.21
:STATus:QUEStionable:PTR	<value>		Firmware 2.21
:STATus:QUEStionable:NTR	<value>		Firmware 2.21

:OPERation?
:STATus:OPERation[:EVENt]?
This query returns the contents of the operation status event register and clears it.

:OPERation:CONDition?
:STATus:OPERation:CONDition?
This query returns the contents of the operation status condition register.

:OPERation:ENABle
:STATus:OPERation:ENABle
This command sets the enable mask of the operation status event register.

:OPERation:PTR
:STATus:OPERation:PTR
This command sets the positive transition filter of the operation status event register.

:OPERation:NTR
:STATus:OPERation:NTR
This command sets the negative transition filter of the operation status event register.

:PRESet
:STATus:PRESet
Disables all status events, clears all negative transition filters and sets all positive transition filters.

:QUEStionable?
:STATus:QUEStionable [:EVENt]?
This query returns the contents of the questionable status event register and clears it.

:QUEStionable:CONDition?
:STATus:QUEStionable:CONDition?
This query returns the contents of the questionable status condition register.

:QUEStionable:ENABle
:STATus:QUEStionable:ENABle
This command sets the enable mask of the questionable status event register.

:QUEStionable:PTR
:STATus:QUEStionable:PTR
This command sets the positive transition filter of the questionable status event register.

:QUEStionable:NTR
:STATus:QUEStionable:NTR
This command sets the negative transition filter of the questionable status event register.

:SYSTem Subsystem

Command	Parameters	Unit (default)	Remark
:SYSTem:ERRor[:NEXT]?			
:SYSTem:PRESet			Firmware 2.216
:SYSTem:VERSion?			
:SYSTem:LOCK			
:SYSTem:LOCK:RELease			Firmware 2.216

:ERRor?
:SYSTem:ERRor[:NEXT]?
Return Parameters: Integer error number
Query command is a request for the next entry in the instrument's error queue. Error messages in the queue contain an integer in the range [–32768, 32768] denoting an error code and associated descriptive text.

:PRESet
:SYSTem:PRESet
Resets most signal generator functions to factory- defined conditions. This command is similar to the *RST command.

:VERSion?
:SYSTem:VERSion?
Returns the SCPI version number that the instrument software complies with [1999.0]

:LOCK
:SYSTem:LOCK
Locks (disables) front panel control.

:LOCK:RELease

:SYSTem:LOCK:RELease
Unlocks (enables) front panel control.

[:SYSTem:COMMunicate] Subsystem

Command	Parameters	Unit (default)
:SYSTem:COMMunicate:LAN:CONFig	DHCP|MANual|AUTO	DHCP
:SYSTem:COMMunicate:LAN:DEFaults		
:SYSTem:COMMunicate:LAN:DHCP:TIMeout		30 sec
:SYSTem:COMMunicate:LAN:DOMain	<string>	
:SYSTem:COMMunicate:LAN:DNS:DYNamic	ON|OFF|1|0	
:SYSTem:COMMunicate:LAN:DNS:OVERride	ON|OFF|1|0	
:SYSTem:COMMunicate:LAN:DNS[:SERVer]	<ipstring>	
:SYSTem:COMMunicate:LAN:GATeway	<ipstring>	"0.0.0.0"
:SYSTem:COMMunicate:LAN:HOSTname	<string>	
:SYSTem:COMMunicate:LAN:IDENtify	ON|OFF|1|0	
:SYSTem:COMMunicate:LAN:IP	<ipstring>	
:SYSTem:COMMunicate:LAN:KEEP:TIMeout	<value>	
:SYSTem:COMMunicate:LAN:RESTart		
:SYSTem:COMMunicate:LAN:SUBNet	<ipstring>	"255.255.255.0"
:SYSTem:COMMunicate:SOCKet[<n>]:ECHO	ON|OFF|1|0	OFF

:LAN:CONFig
:SYSTem:COMMunicate:LAN:CONFig DHCP|MANual|AUTO
:SYSTem:COMMunicate:LAN:CONFig?
This command sets the signal generator's internet protocol (IP) address.

MANual	The user assigns an IP address to the signal generator.
DHCP	The network assigns an IP address to the signal generator. If DHCP fails, manual configuration will be used.
AUTO	The network assigns an IP address to the signal generator with a fallback to Auto- IP if DHCP fails. If both DHCP and Auto- IP fail, manual configuration will be used.

:LAN:DEFaults
:SYSTem:COMMunicate:LAN:DEFaults
This command restores the instrument's LAN settings to their factory default values.

:LAN:DESCription (not implemented)
:SYSTem:COMMunicate:LAN:DESCription <string>
:SYSTem:COMMunicate:LAN:DESCription?
This command defines the instrument's web description. The query returns the current saved setting.

:LAN:DHCP:TIMeout (not implemented)
:SYSTem:COMMunicate:LAN:DHCP:TIMeout {30}|60|90|120sec
:SYSTem:COMMunicate:LAN:DHCP:TIMeout?

This command enables the user to change the maximum length of time that the instrument will spend trying to acquire an IP address using DHCP. If the LAN Config Type is set to Auto, then the Auto- IP protocol will be used as a fall- back when time- out does occur. The DHCP timeout value is stored in the same non- volatile ram as the other LAN configurations. The query returns the current setting, not the saved setting.
Default 30 Seconds

:LAN:DOMain (not implemented)
:SYSTem:COMMunicate:LAN:DOMain <string>
:SYSTem:COMMunicate:LAN:DOMain?
This command defines the domain name of the signal generator's DNS server. This entry defines the DNS server for the signal generator LAN connection. The query returns the current setting, not the saved setting.

:LAN:DNS:DYNamic (not implemented)
:SYSTem:COMMunicate:LAN:DNS:DYNamic ON|OFF|1|0
:SYSTem:COMMunicate:LAN:DNS:DYNamic?
This command turns dynamic Domain Name System (DNS) on/off. The query returns the current setting, not the saved setting.

:LAN:DNS:OVERride (not implemented)
:SYSTem:COMMunicate:LAN:DNS:OVERride ON|OFF|1|0
:SYSTem:COMMunicate:LAN:DNS:OVERride?
This command enables you to override the DNS server that is returned by the DHCP server. The LAN configuration type must be set to Auto or DHCP to use this feature. The query returns the current setting, not the saved setting.

:LAN:DNS[:SERVer] (not implemented)
:SYSTem:COMMunicate:LAN:DNS[:SERVer] <ipstring>
:SYSTem:COMMunicate:LAN:DNS[:SERVer]?
This command defines the IP address of the signal generator DNS server. This entry defines the DNS server for the signal generator LAN connection. The query returns the current setting, not the saved setting.

:LAN:GATeway
:SYSTem:COMMunicate:LAN:GATeway <ipstring>
:SYSTem:COMMunicate:LAN:GATeway?
This command sets the gateway for local area network (LAN) access to the signal generator from outside the current sub- network. The query returns the current setting, not the saved setting.

:LAN:HOSTname
:SYSTem:COMMunicate:LAN:HOSTname <string>
:SYSTem:COMMunicate:LAN:HOSTname?
This command sets the signal generator's local area network (LAN) connection hostname. Maximum 29 characters are allowed. The query returns the current setting, not the saved setting.

:LAN:IDENtify (not implemented)
:SYSTem:COMMunicate:LAN:IDENtify ON|OFF|1|0
This command controls the LAN identify feature. ON(1) The command enables device identification by displaying the full- screen message
"Identify: <IP Address>" on the signal generator's front panel; the LAN Status indicator will also show "IDENTIFY". For more information, refer to the Programming Guide.

OFF(0) This command disables device identification by clearing the message on the signal generator's front panel and returning the LAN Status indicator to display the current network state. For more information, refer to the Programming Guide.

:LAN:IP
:SYSTem:COMMunicate:LAN:IP <ipstring>
:SYSTem:COMMunicate:LAN:IP?
This command sets the signal generator's local area network (LAN) internet protocol (IP) address for your IP network connection.

:LAN:KEEP:TIMeout (not implemented)
:SYSTem:COMMunicate:LAN:KEEP:TIMeout <value>
:SYSTem:COMMunicate:LAN:KEEP:TIMeout?
This command sets the length of time for the TCP Keep Alive setting.
Range 0 sec to 3600 sec

:LAN:RESTart
:SYSTem:COMMunicate:LAN:RESTart
This command restarts the network to enable changes that have been made to the LAN setup.

:LAN:SUBNet
:SYSTem:COMMunicate:LAN:SUBNet <ipstring>
:SYSTem:COMMunicate:LAN:SUBNet?
This command sets the signal generator's local area network (LAN) subnet mask address for your internet protocol (IP) network connection.

:SOCKet:ECHO
:SYSTem:COMMunicate:SOCKet:ECHO
This command turns the echo from the 835-3 controller on or off. Echo is typically turned on only for a telnet session. The 835-3 returns a ">>" prompt when ready.

UNIT Subsystem

Command	Parameters	Unit (default)	Remark
UNIT:POWer	W|V|DBM|DB	DBM	
UNIT:FREQuency	HZ|MHZ|GHZ	HZ	

UNIT:POWer
UNIT:POWer W|V|DBM|DB
*RST DBM

UNIT:FREQuency
UNIT:FREQuency HZ|MHZ|GHZ
*RST HZ

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